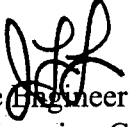


ARIZONA DEPARTMENT OF TRANSPORTATION  
ROADWAY ENGINEERING GROUP  
OFFICE MEMO

March 30, 1999

TO: Roadway Design and Predesign Personnel  
ADOT and Consultants

FROM: John L. Louis   
Assistant State Engineer  
Roadway Engineering Group

RE: **GUIDELINES FOR SCOPING PAVEMENT PRESERVATION  
PROJECTS- APRIL 1999**

The subject document is enclosed for your use in preparing the Project Assessment and in designing Pavement Preservation Projects. The Guide was established to identify work items that can be included in a project using pavement preservation funds and identifies specific safety work that may be included.

It is critical that work items not eligible for pavement preservation funding be identified and committed for other funding during the scoping phase of the project. Additional work items not identified during the scoping phase may not be approved during the design phase.

These Guidelines were prepared by a multidisciplinary team having members representing Roadway Design, Roadway Predesign, Traffic Engineering, and FHWA. The Guidelines have been approved by the FHWA for use on federal-aid projects.

Please distribute the Guidelines to the in-house and consultant personnel preparing scoping documents and designing plans for the Pavement Preservation Program.

JLL/THO  
attachment

c.  
Roadway Engineering Group  
Traffic Engineering Group  
Materials Group  
Bridge Group  
Statewide Project Management  
Local Government Section  
Regional Traffic Engineers  
Engineering Consultant Services  
Districts (10)  
FHWA  
Wayne Collins  
Bill Higgins

**ARIZONA DEPARTMENT OF TRANSPORTATION**

**INTERMODAL TRANSPORTATION DIVISION**

**GUIDELINES FOR SCOPING  
PAVEMENT PRESERVATION PROJECTS**

**APRIL 1999**

**ROADWAY ENGINEERING GROUP**

# **GUIDELINES FOR SCOPING PAVEMENT PRESERVATION PROJECTS**

- Purpose** This guide was developed to clarify the work items that can be addressed with pavement preservation funds and to establish a consistent approach to safety work within the termini of pavement preservation projects. The Guidelines provide full recognition that funding resources for pavement preservation are limited; implementation of full AASHTO safety criteria applied to slopes, guard rail, and other clear zone applications in the same manner that is applied to new construction or major reconstruction is not a feasible alternative for pavement preservation projects. Nevertheless, federal guidelines require a reasonable degree of safety enhancement. The guidelines herein are presented to address safety enhancements to a degree based upon the type and level of usage of the facility. The AASHTO Controlling Design Criteria are addressed under separate documents and are not a part of this Guide.
- Background** With scoping of projects being performed prior to programming, there is little or no control on the amount of work being added to pavement preservation projects due to its convenience of being the only project in the area. Pavement preservation funding is not intended to be used for major improvements to the existing facility, but to extend the usable life of its pavement and address safety issues which can be accomplished within the work scope of pavement preservation projects. Work items normally found in pavement preservation projects were divided into two categories; those dependent on the facility functional classification and traffic (ADT), and those which tend to be more site specific and independent of ADT and roadway classification. ADT in this guide is for the construction year (use anticipated construction year if not yet programmed). Multilane facilities are roadways with four or more through lanes, divided or undivided

The distance to a potential hazard is measured from the edge of the through travel lane; the travel lane is defined as the as-built lane width which is predominately 12'. Therefore the normal method for measurement is from centerline to potential hazard and subtract travel lane.

Safety enhancement treatments may be warranted by supportive accident history (as referred to throughout the text and tables of this guide). The Traffic Engineering Group HES Section will review the accident history to determine if there are specific locations within the project limits that may warrant a spot safety enhancement. The Project Team, in coordination with Traffic HES Section, will evaluate the locations identified and determine any remedial treatment to be included with the project.

The guidelines for safety enhancements are not to be utilized within major sections of rural routes where design speeds or posted speed limits are 45 mph or less. Additionally, they should not be utilized on urban or suburban sections having outside curb or curb and gutter.

There are certain roadway features which must be evaluated with pavement preservation work that are a normal part of projects:

- Shoulder build-up as required.
- Pavement marking and striping will be addressed in accordance with existing traffic policy.
- Rumble strips will be applied in accordance with current policy.
- Turnouts shall be considered for paving in accordance with current policy.
- Delineators and object markers which are missing, damaged, or disturbed by the project should be replaced.
- Embankment curb, spillway and down drain inlets impacted by overlays are routinely addressed.
- Ramp gores are evaluated for necessary treatment of existing curbing.

Implementation of these guides may not always be practicable. Exceptions can be granted by approval of Assistant State Engineer, Roadway Group. Requests with justifications shall be submitted in writing similar to Design Exceptions.

The following items are addressed within this guide:

### SAFETY ITEMS

- Guard Rail
  - Reconstruction
  - Length of need
  - New location for slope protection
  - New location for fixed object
- Pipe Culvert and Headwalls
- Slope Flattening
- Cut Ditches
- Tree Removal
- Chain Link Cable Barrier
- “L” Headwall Removal
- Rock Cuts

### OTHER WORK ACTIVITIES

- Erosion Problems
- Culvert Replacement or Relining
- Approach Slabs
- Rock Fall Problems
- Drainage Problems
- Intersection Radii Problems
- Signing, Delineators, Object Markers
- Additional Special Purpose Lane (re-striping only)
- Handicap (ADA) Ramps
- Curb, Gutter and Sidewalk Replacement
- Fencing
- Cattle Guards

## **SAFETY ENHANCEMENTS**

### **CHAIN LINK CABLE BARRIER**

The Chain Link Cable Barrier is normally utilized as a secondary safety measure in addition to guard rail.

The Cable Barrier is not intended to be utilized for all median situations. A decision must be made regarding the potential consequences of a vehicle traversing the area being considered. Where there is crossroad traffic below, a canal structure or other severe drop-off, the barrier should be installed. Where there is a reasonable chance of traversing the drainageway or coming to a stop, and the length of guard rail need is met, there may not be a need for Cable Barrier.

The current Chain Link Cable Barrier (Std. C-12.30) is a two-cable system. This does not require that previous 3-cable versions of the standard already in place be removed and replaced. Again, each existing situation should be reviewed and a determination made whether the existing installation is appropriate. The fact that all existing site conditions may not meet the current detail does not mean an existing installation is non-functional. Good engineering judgment is required and ultimate disposition can be arrived at through discussions with representatives of District and FHWA. The final resolution, however, rests with the design engineer.

### **GUARD RAIL**

Existing guard rail on all classes of roadways will be reconstructed to current standards if it has a deficiency in any of the following conditions: post spacing, block out, lack of structure attachment, height less than minimum acceptable after overlay, rail element (type), flare, BCT end treatment, or without end treatment (blunt end). If reconstruction is not required due to any of the described deficiencies, reconstruction for length of need will not be undertaken. When reconstruction is required, length of need shall be evaluated for guard rail placement.

**The following chart is provided for determination of guard rail placement where no guard rail is presently in place:**

**Pavement Preservation/Safety Enhancement Guidelines  
GUARD RAIL CRITERIA FOR NEW LOCATIONS**

	For Fixed Object	Fill Slope Protection
I. Freeways <sup>(1)</sup>	Yes, if within 25' of travel lane - relocate or shield	Yes, in accord with Roadway Design Guidelines (ADOT)
II. Multilane <sup>(1)</sup>	Yes, if within 12' of travel lane - relocate or shield <sup>(2)(3)</sup>	Yes, where embankment height $\geq$ 20' with slopes steeper than 3:1
III. 2 Lane ADT >5000 <sup>(1)(2)</sup>	Same as Multilane <sup>(2)</sup>	Same as Multilane
IV. 2 Lane ADT 2500-5000 <sup>(1)(2)</sup>	No. Mark objects if within 12' <sup>(3)</sup>	a) Fill slopes on outside of curves $\geq 3^\circ$ with embankment height $\geq 20'$ & slopes steeper than 3:1 b) Accident history
V. 2 Lane ADT <2500 <sup>(1)(2)</sup>	No. Mark objects if within 12' <sup>(3)</sup>	Accident history

**Notes:**

- <sup>(1)</sup> All classes - do not add guard rail in heavy snow removal areas unless accident history warrants.
- <sup>(2)</sup> 2 lane, 2 way traffic - do not add guard rail to both sides of narrow roadways 28' wide and less without due consideration for additional guard rail offset. Consideration should also be given to accident history, horizontal curvature, sight distance, and delineation of one or both sides of roadway.
- <sup>(3)</sup> If accident history - relocate or shield. Do not mark trees.

General Note: For accident history, see page 2.



## Pavement Preservation/Safety Enhancement Guidelines

### SAFETY TREATMENTS FOR UNSHIELDED PIPES, CULVERTS, AND HEADWALLS

Item Facility	Pipe/Culvert Size	Distance from Travel Lane	Extension from Edge of Travel Lane	Marking <sup>(3)</sup>
Freeways <sup>(1)</sup>	>36" pipe and Culvert Headwalls	>25' ----- -- <25'	No ----- --- Economic Analysis to extend or shield <sup>(4)</sup>	Mark at headwall  (4)
Freeways <sup>(1)</sup>	≤36" pipe	20' - 30' ----- -- < 20'	No. Include end sections for pipes 24"-36" ----- --- Extend to toe of slope or clear zone per Roadway Design Guidelines. Add end sections.	No

Continued

**Pavement Preservation/Safety Enhancement Guidelines**  
**SAFETY TREATMENTS FOR UNSHIELDED PIPES, CULVERTS, AND**  
**HEADWALLS continued**

Item Facility	Pipe/Culvert Size	Distance from Travel Lane	Extension from Edge of Travel Lane	Marking <sup>(3)</sup>
Multilane Highways <sup>(2)</sup> and 2-Lane Highway with ADT >5000 <sup>(3)</sup>	> 36" pipe and Culvert Headwalls	<3'  ----- --  3' - 12'  ----- --  >12'	Extension preferred to 12' min.- desirable to clear zone per RDG. (If extension not practical, then shield). ----- --- Economic Analysis to extend or shield <sup>(5)</sup> ----- ---  No	Mark at headwall.  (4)
Multilane Highways <sup>(2)</sup> and 2-Lane Highway with ADT >5000 <sup>(3)</sup>	≤ 36" pipe	<3'  ----- --  3' -12'  ----- --  >12'	Extend to 12' or Clear Zone. Extend to side slope (if already extends beyond side slope, no extension necessary). Include end sections with extensions. ----- -- No, if end at side slope. If end is within side slope, extend to side slope. Include end sections with extensions ----- ---  No	No

Continued

**Pavement Preservation/Safety Enhancement Guidelines**  
**SAFETY TREATMENTS FOR UNSHIELDED PIPES, CULVERTS, AND**  
**HEADWALLS continued**

Item Facility	Pipe/Culvert Size	Distance from Travel Lane	Extension from Edge of Travel Lane	Marking <sup>(3)</sup>
2-Lane Hwys. ADT 2500- 5000	> 36" pipe and Culvert headwalls	$< 3'$ ----- -- 3' to 12' ----- -- >12'	Extend to 12' ----- -- No ----- -- No	Mark at headwall (4)
2-Lane Hwys. ADT 2500- 5000	$\leq 36''$ pipe	$<12'$	No	No
2-Lane Hwys. ADT <2500	> 36" pipe and Culvert headwalls  $\leq 36''$ pipe	$<12'$	No   No	No   No

- (1) Ramps will be treated same as mainline except clear zone will be based on reasonable operating speed.
- (2) Median pipe culverts treated same. If culvert within 20' of other roadway culvert, consider connecting to eliminate hazard.
- (3) Parallel pipe culverts within 20' of through traffic lane may be considered for safety end sections.
- (4) Mark headwalls within clear zone where practical with terrain. Details to be developed and coordinated with Traffic Engineering.
- (5) When performing an economic analysis, the guard rail cost shall be multiplied by a factor of 3 for alternative comparison purposes.

## **Pavement Preservation/Safety Enhancement Guidelines**

### **EMBANKMENT SLOPE FLATTENING**

**A. Where no Guard Rail exists, slope flattening may be considered when all of the following apply:**

1. New R/W is not required
2. Fill not higher than 12'
3. No fixed objects at bottom of fill slope within 10' of toe
4. Economical fill material is available
5. Existing slope is steeper than 4:1
6. If pipes exist that are >36", first evaluate Culvert Criteria. Flatten if culvert is to be extended. If no extension, then no flattening
7. New fill slope will achieve a 4:1 rate or flatter

**B. Where Guard Rail exists, slope flattening may be considered when all of the following apply:**

1. If reconstructing existing Guard Rail, see criteria above except if a structure >36" exists, then no flattening
2. If not reconstructing existing Guard Rail, no slope flattening
3. Suitable material is available as a result of other activity

## **Pavement Preservation/Safety Enhancement Guidelines**

### **CUT DITCHES**

Cut ditches on all classes of roadways will generally remain as is, however, cut ditches may be considered for widening if there is a demonstrated problem with any of the following:

- a) Inadequate drainage capacity with water having flowed onto roadway.
- b) Inadequate width for snow removal in a long narrow cut.
- c) Shading of roadway resulting in an icing problem.

Design personnel should consult with District representatives to verify existence of problem ditches; maintenance personnel must be able to cite or convey the specific problem area.

Cut ditches may be considered for erosion protection treatment if the condition jeopardizes the integrity of the adjacent pavement and the scope of the corrective work is beyond the capability of maintenance forces.

Widening of cut ditches because the material could then be utilized for slope flattening at a “to be determined” location will not be allowed.

If an embankment slope first meets the criteria to flatten under “Embankment Slope Flattening,” then cut ditches may be utilized to obtain the required material.

## Pavement Preservation/Safety Enhancement Guidelines

Item Facility	Tree Removal Clear Zone Sight Distance <sup>(1)</sup>	Chain Link Cable Barrier	“L” Head Wall Removal	Rock Cuts
Freeway	Yes > 4” dia. within clear zone or 30’max.	Yes Per design policy	Yes	Yes Per Interstate policy
Multilane Highways	Same as Freeway	Yes Per design policy	Yes	Yes Shy distance per Roadside Guide (see next page)
2 Lane Hwys. ADT >5000	Yes > 4” dia. and within 12’ of travel lane	Not applicable	Yes	No Unless accident history
2 Lane Hwys. ADT 2500- 5000	No Unless accident history	Not applicable	No	No Unless accident history
2 Lane Hwys. <2500	No Unless accident history	Not applicable	No	No Unless accident history

Notes:

<sup>(1)</sup> When on National Forest subject to concurrence of Forest Service.

General Note: For accident history, see page 2.

# ROADWAY DESIGN GUIDE

## SHY DISTANCE

### ROCK CUTS - MULTILANE FACILITIES

DESIGN SPEED

SHY LINE OFFSET  $L_s$

<u>mph</u>		<u>feet</u>	
80		12	
70		10	
60		8	
50		6.5	
40		5	

Evaluate the need to widen cut or place protective barrier as described in the “Criteria for Determining Treatment of Rock Cuts for Interstate Highways” May 1990, but utilize the above chart for warrants when shy line offset is less than chart value.

Shy line offset is the distance from edge of travel way (lane edge) beyond which a roadside object will not be perceived as hazardous and result in a motorist reducing speed or changing vehicle position on the roadway.

### OTHER ITEMS TO BE CONSIDERED

The following items, which are largely dependent upon specific site conditions, should be considered during the project scoping process to determine if they are necessary or desirable to include in the pavement preservation project. **Some of these items may be included with the pavement preservation funding; these items will be identified in bold type.** *However, unless these items are essential to the pavement preservation work, funds from sources other than the pavement preservation budget must be provided to cover the additional cost.*

**EROSION PROBLEMS** -- Correction of major erosion problems may be included in pavement preservation projects if all of the following apply: (1) the corrective work is beyond the capability of maintenance forces, (2) the problems jeopardize the existing pavement structure, (3) the corrective work is compatible with the time schedule for the pavement preservation project, and (4) the corrective work does not require new right-of-way.

**CULVERT REPLACEMENT OR RELINING** -- Deteriorated culverts and pipes which threaten the pavement structure may be replaced or relined as part of the pavement preservation project. In addition, existing pipes and culverts which are to be extended should be checked to assure that they do not have serious deterioration or structural problems.

**APPROACH SLABS** -- All bridge approach slabs within the project limits of a proposed pavement preservation project should be checked visually to determine if they are functioning properly and provide a reasonably smooth transition onto and off of the bridge(s). Corrective work may be included in the pavement preservation project when deemed appropriate by District and technical representatives of the project team.



ROCK FALL PROBLEMS -- Rock fall problems are being addressed under a separate program administered by ADOT's Geotechnical Design Section. Major rock fall improvements may be combined with pavement preservation projects, but only if (1) additional funds from sources other than the pavement preservation budget are provided, and (2) the rock fall improvements do not delay the pavement preservation project due to extensive geotechnical analysis and design, new right-of-way, or protracted coordination with land management agencies. **Minor rock fall containment improvements, which do not require extensive analysis or cause significant delays in project development, may be considered in pavement preservation projects.**

DRAINAGE PROBLEMS -- Drainage problems fall into two categories -- subsurface drainage and surface drainage. **Subsurface drainage problems are usually directly associated with pavement problems and should be thoroughly evaluated and included in the Materials Memo.** Surface drainage problems may also be associated with pavement problems and these situations should be addressed in the same manner as the subsurface drainage problems. However, surface drainage problems often involve other problems not directly associated with pavement structure, such as ponding, missing or poorly located catch basins, curbs and inlets, and even inadequate cross drainage pipe.

Drainage problems not directly associated with pavement preservation may be included in pavement preservation projects if (1) they do not require an extensive drainage study, (2) the corrective work is compatible with the time schedule for the pavement preservation project, and (3) the corrective work does not require new right-of-way. Funding from an alternate source is required.

INTERSECTION RADII PROBLEMS (Non-Freeway Interchange Locations)  
**Where operational problems are identified, minor pavement widening to correct intersection turning radii may be included in pavement preservation projects if they involve only pavement and related work (base courses, curb or curb and gutter, etc.).** Improvements involving additional right-of-way, significant additional grading and/or drainage, or extensive utility relocations are beyond the scope of pavement preservation projects. Funding from alternate source is required.

SIGNING, DELINEATORS, & OBJECT MARKERS -- Project wide upgrading of signs, delineators, and object markers may be included, but will require alternate funding source. **Replacement of damaged, missing, or disturbed delineators and object markers may be included with pavement preservation work.**

ADDITIONAL SPECIAL PURPOSE LANES (Restriping Only) -- Where sufficient pavement width already exists, pavement preservation projects provide an opportunity to create left or right turn lanes, continuous two-way left turn lanes, climbing lanes and passing lanes by restriping using available shoulder width. In general, such restriping installations should maintain full standard lane widths for all existing and newly created lanes. A design exception is required for all situations where reduced (substandard) shoulder widths are created by the restriping. ADOT's Traffic Engineering Group should review all candidate locations for additional special purpose lanes to assure that they meet warrants or are otherwise supported by appropriate traffic engineering analyses.

In addition, the reduced clearance to roadside obstacles (pipe ends, headwalls, trees, etc.) created by the new location of the through traffic lanes should be taken into consideration in determining the need for pipe extensions, headwall removals, tree removals, and similar clear zone improvements.

NOTE: It should be clearly understood that restriping the existing pavement width to create special purpose lanes (left or right turn lanes, continuous left turn lanes, climbing lanes or passing lanes) using the available shoulder width is only appropriate for pavement preservation projects and certain other spot safety or capacity improvements. New construction, roadway reconstruction projects and major pavement widening projects should provide sufficient roadway and pavement width to accommodate both shoulders and the special purpose lanes.

In most cases, additional special purpose lanes which require additional pavement width (pavement widening, etc.) are beyond the scope of pavement preservation projects. Such projects should be developed under separate programs and funded from sources other than the pavement preservation budget.

**HANDICAP (ADA) RAMPS** -- Handicap ramps conforming to ADA requirements will be installed at appropriate locations where curb or curb and gutter exists within the limits of pavement preservation projects. Existing handicap ramps will normally remain in place, however, modification of existing handicap ramps which do not reasonably comply with ADA requirements will be considered.

**CURB/GUTTER and/or SIDEWALKS** -- Minor spot improvements to curbs, curb and gutter and/or sidewalk may be included in pavement preservation projects. However, extensive curb, curb and gutter or sidewalk improvements are clearly beyond the general scope of pavement preservation projects. Addition funds from sources other than the pavement preservation program budget should be used for such extensive improvements.

**FENCING IMPROVEMENTS** -- Fencing improvements should be limited to spot improvements. Extensive new fence installations or wholesale replacement or rehabilitation of existing fence are clearly beyond the scope of pavement preservation and should be included only if a separate source of funds is obtained. In addition, any additional fence work should not cause a delay to time schedule for the pavement preservation project.

**CATTLE GUARD** -- Improvements to existing cattle guards, including complete removal where appropriate, should be considered and may be included in pavement preservation projects for all cattle guards located on freeway ramps, interchange crossroads and on other mainline pavements and ramps. Improvement or removal of existing cattle guards on non-interchange crossroads, driveways and other entrances, and the installation of additional cattle guards at new locations may also be appropriate, but normally should be funded with funds from sources other than the pavement preservation budget.